#320 120 2613

42390.P7111 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#24
Rose
7/12/02

In re Application of:)
)
Jeffrey S. McVeigh, et al.)
)
Application No.: 09/274,157)
)
Filed: March 22, 1999)
)
For: Method and Apparatus for Simplifying)
Frame-Based Motion Estimation)

Examiner: Richard J. Lee

Group Art Unit: 2613

BOX APPEAL
Honorable Commissioner for Patents and Trademarks
Washington, D.C. 20231

APPELLANT'S BRIEF UNDER 37 C.F.R. § 1.192
IN SUPPORT OF APPELLANT'S APPEAL
TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

Sir:

Applicants (hereafter "Appellants") hereby submit this Brief in triplicate in support of an appeal from a Final Office Action mailed February 20, 2002, in the above referenced case. Appellants respectfully request consideration of this appeal by the Board of Patent Appeals and Interferences for allowance of the present patent application.

An oral hearing is not desired.

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TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The present U.S. Patent application is assigned to Intel Corporation of 2200 Mission College Boulevard, Santa Clara, California 95052.

II. RELATED APPEALS AND INTERFERENCES

To the best of the Appellants' knowledge, there are no appeals or interferences related to the present appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision.

III. STATUS OF THE CLAIMS

Presently claims 1-19 are pending in the above referenced application. Claims 1-19 were rejected in the Final Office Action mailed February 20, 2002 and are the subject of this appeal.

Claims 1-19 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,801,778 issued to John Ju (*Ju*).

IV. STATUS OF AMENDMENTS

In response to the Office Action mailed February 20, 2002, rejecting claims 1-19, Appellants timely filed a Notice of Appeal on May 20, 2002.

A copy of the currently pending claims is attached hereto as Appendix A.

V. SUMMARY OF THE INVENTION

The pending application is directed to a method and apparatus for reducing the complexity of multimedia encoding and, more particularly to a method and apparatus for simplifying frame-based motion estimation.

Conventional multimedia encoding is typically a computationally expensive process, often relegated to dedicated systems, or processors within systems. Such encoding typically involves the compression of the multimedia content to reduce the storage and/or communication bandwidth requirements associated with such data. To facilitate this compression of, e.g., video content, a compressor analyzes the content to identify spatial and temporal redundancies. An example of just such a compression technique is that of the MPEG-2 standard (ISO/IEC 13818-2, entitled "Generic Coding of Moving Pictures and Associated Audio Information: Video", 1996(E)), developed by the Moving Picture Experts Group of the International Standards Organisation.

Of particular relevance to the instant application is the conventional method for performing motion estimation on a bi-directionally predicted frame, a so-called B-frame. An example implementation of such a conventional motion estimation process is presented in a patent issued to *Ju* (USP 5,801,778), cited during prosecution of the pending application. In *Ju*, the content of each macroblock of a B-frame is predicted, macroblock-by-macroblock, by one of "(a) intracoded, (b) unidirectional forward predictive coded, (c) unidirectional backward predictive coded using temporal encoding relative to a subsequent reference frame, or (d) bidirectional predictive coded using temporal encoding relative to previous and subsequent reference frames" (see, e.g., col. 2, lines 26-38).

While the exhaustive motion estimation process of the prior art (e.g., *Ju*) does provides for high-quality video encoding, it is computationally expensive to perform. In this regard, the conventional encoding process is not well-suited for a general purpose computing environment application, where the general purpose processor(s) are controlling a number of different aspects of the computing environment. Thus, the pending application is directed to a method and apparatus for encoding media that is computationally less expensive and, as such, more suitable for a general purpose computing environment.

More particularly, the claimed invention is generally directed to a method and apparatus for encoding B-frame content. In accordance with one aspect of the invention, the prediction of the content of an entire B-frame is restricted to the temporally closest anchor (e.g., intra-coded (I) frame, or predictive coded (P) frame). In this regard, claim 1, for example, is directed to a method of encoding media content including the features of:

> receiving a stream of data comprising one or more bidirectionally interpolated frames (B-frame) and a plurality of anchor frames; and
>
> *unidirectionally* predicting content of each B-frame from a temporally closest anchor frame. (*emphasis* added)

According to this aspect of the invention, a system for simplifying compression is presented wherein a single anchor frame is selected from which the content of a B-frame is to be predicted rather than employing the traditional method of selecting, on a macroblock-by-macroblock basis, the number and type of anchor frames to predict individual macroblocks of the B-frame (see, e.g., pg. 18, line 3 through pg. 19, line 19).

The innovative temporally constrained, unidirectional B-frame technique has been empirically shown to provide substantially the same quality of decoded picture as a

conventional encoding process, while using only a fraction of the normal computational requirements (see, e.g., page 19 lines 11-19, and Appendix A of the Application).

Thus, methods and apparatus for simplifying frame-based motion estimation are presented, unencumbered by the deficiencies and limitations inherent in conventional digital encoders.

VI. ISSUES PRESENTED

I. Whether claims 1-19 are anticipated by the *Ju* reference, pursuant to 35 U.S.C. § 102(e).

VII. GROUPING OF CLAIMS

For purposes of this appeal, claims 1-19 will stand or fall together.

VIII. ARGUMENTS

A. Rejection of claims 1-19 as being anticipated by a patent issued to Ju under 35 U.S.C. §102(e) is improper insofar as *Ju* fails to disclose or suggest the required element of unidirectionally predicting content of each B-frame from a single temporally closest anchor frame.

The *Ju* Reference

As introduced above, the *Ju* reference is generally drawn to the well-accepted method of motion estimation wherein a predicted frame is predicted, *on a macroblock by macroblock basis*, using information from *preceding and/or superseding frames* (see, e.g., col. 2, lines 18-

50; and col. 3, lines 15-19). In this regard, *Ju* discloses a brief description of a conventional MPEG-2 video compression scheme.

In the passages relied upon by the Examiner, *Ju* merely discloses the computationally expensive motion estimation process disclosed in the background of the pending application and, accordingly, is illustrative of the limitations in the prior art that the claimed invention was developed to overcome. In *Ju*, individual such video encoding is performed on a macroblock-by-macrobloc basis. In this regard, any given macroblock within a B-frame may be "(a) intracoded, (b) unidirectional forward predictive coded, (c) unidirectional backward predictive coded using temporal encoding relative to a subsequent reference frame, or (d) bidirectional predictive coded using temporal encoding relative to previous and subsequent reference frames" (see, e.g., col. 2, lines 31-35).

Thus, according to the teachings of *Ju*, a single B-frame may have macroblocks which are encoded using content from a number of different predictive sources without regard to which frame is the temporally closest frame.

Rejected Claim(s)

In contradistinction to the teachings of the *Ju* reference, claims 1-19 are generally directed to a method of *frame-based* motion estimation that is computationally less expensive that conventional motion estimation techniques such as those disclosed in *Ju*. In this regard, rejected claim 1, for example, is directed to a method for performing motion estimation including the features of:

> receiving a stream of data comprising one or more bidirectionally interpolated frames (B-frame) and a plurality of anchor frames; and

unidirectionally predicting content of each B-frame
from a temporally closest anchor frame.

That is, rejected claim 1, for example, is directed to a method of predicting the content of each B-frame based upon a single anchor frame. Rejected claim 1 further limits which anchor frame may be used for predicting the content to the anchor frame that is temporally closest. Despite the assertion in the Action to the contrary, *Ju* does not anticipate, disclose and/or suggest the unidirectional, temporally restrained, frame-based motion estimation process of, for example, rejected claim 1.

Rather, as presented above, *Ju* merely teaches the limited method of the prior art, i.e., "[a] B-frame macroblock may be predicted from a macroblock of an I-frame or a P-frame" (see e.g., col. 2, lines 35-37). *Ju* teaches, as presented above, that a single B-frame may have macroblocks which are encoded using content from a number of different predictive sources without regard to which frame is the temporally closest frame (see, e.g., col. 2, lines 31-35). The macroblock-by-macroblock based approach of *Ju* is computationally expensive, and teaches away from the limitation in, for example, claim 1 that the B-frame content be predicted from "a temporally closest anchor frame" (See, e.g., pg. 28 claim 1).

Applicant respectfully submits that an artisan reading the *Ju* reference would simply gain a general, non-enabling familiarity with a conventional MPEG-2 macroblock-based motion estimation process. In this regard, the *Ju* reference fails to teach each and every element of the rejected claim(s) as presented in the claim(s). Indeed, Applicant respectfully asserts that the macroblock-based, bidirectional motion estimation process described in the *Ju* reference actually **teaches away from** the unidirectional, frame-based motion estimation process of, for example, rejected claim 1.

As is well established, for a document to anticipate a claim under 35 U.S.C. §102(e), the document must disclose all the elements and limitations of the claim. See, e.g., Scripps Clinic & Research Foundation v. Genentech, Inc., 18 USPQ2d 1001, 1010 (Fed. Cir. 1991).

In this case, the *Ju* reference fails to teach or suggest the required features of unidirectionally predicting content of each B-frame from a temporally closest anchor frame. Accordingly, Appellant respectfully asserts that rejected claim 1 is neither anticipated by nor rendered obvious in light of the *Ju* reference.

Thus, in light of the foregoing, Applicant respectfully asserts that the *Ju* reference fails to anticipate or render obvious that which is claimed in rejected claim 1. Accordingly, Applicant respectfully requests that the § 102(e) rejection of claim 1 be withdrawn.

Applicant submits that rejected claims 8 and 16 enjoy features similar to those introduced above and, as such, are directed to an apparatus or executable content to perform temporally constrained, unidirectional prediction of a B-frame. Accordingly, Applicant respectfully asserts that rejected claims 8 and 16 are likewise patentable over the *Ju* reference for arguments analogous to those used to distinguish claim 1 from the *Ju* reference. Thus, Applicant respectfully request that the §102(e) rejection of claims 8 and 16 be withdrawn.

Applicant notes that claims 2-7, 9-15 and 17-19 are dependent upon patentable base claims 1, 8 or 16, respectively. Accordingly, in addition to any independent basis for patentability, Applicant respectfully submits that claims 2-7, 9-15 and 17-19 are likewise patentable over the *Ju* reference by virtue of at least such dependencies. Accordingly, Applicant respectfully requests that the § 102(e) rejection of claims 2-7, 9-15 and 17-19 be withdrawn.

In view of at least the foregoing, Appellant respectfully requests that the §102(e) rejection of claims 1-19 be reversed.

IX. CONCLUSION

Appellant respectfully submits that claims 1-19 in this application are patentable and requests that the Board of Patent Appeals and Interferences overrule the Examiner and direct allowance of the rejected claims.

This brief is submitted in triplicate along with a check for $300 to cover the appeal fee for one other than a small entity as specified in 37 C.F.R. § 1.17(f). Please charge any shortages and credit overcharges to deposit Account No. 02-2666.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

Date: 6.20.02

Michael A. Proksch
Attorney for the Appellant
Reg. No. 43,021

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to Commissioner of Patents, Washington, D.C. 20231 on:

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DEREK S. WATSON
Name of Person Mailing Correspondence

Signature 6.20.02
Date

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Seventh Floor
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(503)684-6200

APPENDIX A – Pending Claims

1. A method for performing motion estimation comprising:

receiving a stream of data comprising one or more bidirectionally interpolated frames (B-frame) and a plurality of anchor frames; and

unidirectionally predicting content of each B-frame from a temporally closest anchor frame.

2. The method of claim 1, wherein the content of the B-frames is unidirectionally predicted from the content of the temporally closest anchor frame and one or more motion vectors.

3. The method of claim 2, wherein the one or more motion vectors represent an activity measure of the temporally closest anchor frame.

4. The method of claim 3, wherein the motion vector is determined by a sum of absolute differences in activity within the temporally closest anchor frame.

5. The method of claim 1, wherein the temporally closest anchor frame selected to unidirectionally predict the content of the B-frame may either precede or supersede the B-frame.

6. The method of claim 1, wherein the plurality of anchor frames and B-frames contain progressive video content.

7. The method of claim 1, wherein the plurality of anchor frames and B-frames contain interlaced video content.

8. An apparatus comprising:

a motion estimation circuit to receive one or more bidirectionally interpolated frames (B-frame) and a plurality of anchor frames, and to unidirectionally predict content of each of the plurality of B-frames from a select anchor frame.

9. The apparatus of claim 8, wherein the motion estimation circuit predicts the content for each B-frame from a temporally closest anchor frame.

10. The apparatus of claim 8, wherein the motion estimation circuit generates a motion vector based, at least in part, on the selected anchor frame.

11. The apparatus of claim 10, wherein the motion vector represents an activity measure of the anchor frame.

12. The apparatus of claim 10, wherein the motion estimation circuit generates the motion vector from a sum of absolute differences in activity within the anchor frame.

13. The apparatus of claim 10, wherein the motion estimation circuit unidirectionally predicts the content of B-frames from a temporally closest anchor frame and one or more motion vectors generated therefrom.

14. The apparatus of claim 13, wherein the motion estimation circuit generates the one or more motion vectors from a sum of absolute differences in activity within the temporally closest anchor frame.

15. The apparatus of claim 8, wherein the motion estimation circuit utilizes either a preceding or superseding anchor frame to predict B-frame content, depending on which is temporally closer to the B-frame.

16. A storage medium comprising a plurality of executable instructions which, when executed, cause an executing processor to implement a motion estimation function to unidirectionally predict content of each of a plurality of received bidirectionally interpolated frames (B-frames) from a select anchor frame.

17. The storage medium of claim 16, wherein the motion estimation function utilizes either a preceding or superseding anchor frame to predict B-frame content, depending on which is temporally closer to the B-frame.

18. The storage medium of claim 16, wherein the motion estimation function generates a motion vector from a sum of absolute differences in activity within the select anchor frame to encode the B-frame.

19. The storage medium of claim 16, wherein the motion estimation function selects the temporally closest anchor frame to the B-frame as the select anchor frame.

PTO/SB/21 (08-00)
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	18

Application No.	09/274,157
Filing Date	March 22, 1999
First Named Inventor	Jeffrey McVeigh
Group Art Unit	2613
Examiner Name	R. Lee
Attorney Docket Number	42390P7111

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ENCLOSURES *(check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
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  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Assignment Papers *(for an Application)*
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Michael A. Proksch, Reg. No. 43,021 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	Michael Proksch
Date	June 20, 2002

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FEE TRANSMITTAL for FY 2002

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 320.00

Complete if Known	
Application Number	09/274,157
Filing Date	March 22, 1999
First Named Inventor	Jeffrey McVeigh
Examiner Name	R. Lee
Group/Art Unit	2613
Attorney Docket No.	42390P7111

METHOD OF PAYMENT (check one)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None
☐ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	740	201	370	Utility filing fee	
106	330	206	165	Design filing fee	
107	510	207	255	Plant filing fee	
108	740	208	370	Reissue filing fee	
114	160	214	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims		** =		X =	
Independent Claims		=		X =	
Multiple Dependent				=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	84	202	42	Independent claims in excess of 3
104	280	204	140	Multiple Dependent claim, if not paid
109	84	209	42	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	920	217	460	Extension for reply within third month	
118	1,440	218	720	Extension for reply within fourth month	
128	1,960	228	980	Extension for reply within fifth month	
119	320	219	160	Notice of Appeal	
120	320	220	160	Filing a brief in support of an appeal	320.00
121	280	221	140	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,280	241	640	Petition to revive - unintentional	
142	1,280	242	640	Utility issue fee (or reissue)	
143	460	243	230	Design issue fee	
144	620	244	310	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Processing fee under 37 CFR 1.17(q)	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	740	249	370	For each additional invention to be examined (37 CFR § 1.129(b))	
179	740	279	370	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	
Other fee (specify)					

*Reduced by Basic Filing Fee Paid

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SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Michael A. Proksch	Registration No. (Attorney/Agent)	43,021	Telephone	(503) 684-6200
Signature	Michael Proksch			Date	06/20/02

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